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METHOD OF TESTING MICROHARDNESS OF ELECTROPLATED COATINGS

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METHOD OF TESTING MICROHARDNESS OF ELECTROPLATED COATINGS

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Indian Standard

METHOD OF TESTING MICROHARDNESS OF ELECTROPLATED COATINGS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 10 June 1980, after the draft finalized by the Metallic Finishes Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Hardness of hard and soft electroplated coatings is measured by knoop indenter. The test may serve as a useful tool for bath control, particularly in the case of coatings such as gold, for which the hardness will be sensible to the composition of the bath and all the plating variables. Knoop hardness test requirements have been specified in IS : 3266-1965*, which is under revision.

0.3 In reporting the result of analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960†.

1. SCOPE

1.1 This standard covers the determination of the hardness of metallic coatings upon various substrates. The measurements are made with the knoop indenter under a test load of 25 or 100 gf. The test shall be carried out in accordance with IS : 6885-1973‡.

2. SPECIAL REQUIREMENT

2.1 The measurement shall be made on the cross section with the measured diagonal (long) parallel to the substrate using a knoop indenter.

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*Specification for electroplated coatings of gold for general engineering purposes.

†Rules for rounding off numerical values (*revised*).

‡Method for knoop hardness testing of metals.

2.1.1 The thickness of the coating shall be at least 40 µm for soft coatings (such as gold, copper, and silver coatings), and 25 µm for hard coatings (such as nickel, cobalt, and iron coatings). This is approximately equivalent to 0·6 times the length of the measured knoop diagonal.

2.1.2 The indent should be made near the centre of the coating.

2.2 No single test load is applicable to all coatings. A 25 gf load shall be used for precious metals and soft coatings (50-300 HK) and a 100 gf load shall be used for hard coatings (over 300 HK).

NOTE — The knoop hardness number decreases appreciably with increase in load from 25 to 100 gf, especially for higher hardness numbers.

2.3 The length of diagonal to be measured, expressed in filar units, shall span not less than 100 filar units at the magnification selected for the measurement.

2.4 The indents shall be spaced from each other at least 1·5 times the distance of the diagonal parallel to the substrate.

3. PREPARATION OF TEST SPECIMEN

3.1 Overplate the specimen to a thickness of at least 12 µm with a contrasting metal whose hardness approximates that of the coating.

3.2 Remove a section of the specimen (transverse to the plated coating).

3.3 Mount, polish, and lightly etch the section, as described in IS : 6885-1973*.

NOTE — Procedures at **3.1** and **3.3** may be interchanged at the discretion of the operator.

4. PROCEDURE

4.1 Insert the mounted specimen into the testing machine and measure the hardness in accordance with the recommendations of the manufacturer of the testing machine (*see* IS : 6885-1973*).

5. REPORT

5.1 Test results shall be reported as an average of at least five indentations, and also as a range, that is, the high, the low, and the average hardness numbers.

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*Method for knoop hardness testing of metals.

5.2 The hardness numbers shall be reported as HK and the load shall be reported in gram-force by subscript notation, following the HK. For example: 400 HK_{100}, 350 HK_{100}.

5.3 Test Coupons

5.3.1 Test coupons may be used if the production parts have insufficient plating thickness for measurement. The values obtained may not reflect the 'true' hardness of the thin coatings on production parts. However, the values may be useful when they correlate with other coating properties such as wear resistance. The plating conditions for test coupons, such as current density, temperature, agitation and solution composition, should be kept as close as possible to those employed on production parts in the plating process under test.

5.3.2 When the coating is cracked, or cracks when the indenter strikes it, valid hardness numbers will not be obtained.

INDIAN STANDARDS
ON
METHODS OF TESTS FOR METALLIC COATINGS

IS :	
3203 1965	Methods of testing local thickness of electroplated coatings
5523-1969	Methods of testing anodic coatings on aluminium
5528-1969	Methods of testing corrosion resistance of electroplated and anodized aluminium coatings by copper accelerated acetic acid salt spray (CASS) test
6009-1970	Method for evaluation of accelerated corrosion tests
6012-1970	Measurement of coating thickness by eddy current
6910-1973	Method of testing corrosion resistance of electroplated and anodized aluminium coatings by acetic acid salt spray test
8038-1976	Corrosion resistance of nickel-chromium plating by the corrodkote test
8375-1977	Method for checking continuity of anodized coatings
8435-1977	Methods for measurement of thickness of metallic coatings on plastic
8436-1977	Methods for thermal cycling test for evaluation of electroplated plastics
8554-1977	Methods for checking insulation of anodized coating by measurement of breakdown potential
9530-1980	Method of testing microhardness of electroplated coatings